

Analysis of Bluefin Tuna and Menhaden Schools From Images Collected From Small UAS.

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Mobile animals (i.e., fish) near the sea surface pose a challenge for sampling with traditional methods such as nets and hull-mounted acoustics. From the air, optical imagery can provide quantitative measures of fish schools that spend time near the sea surface. Initial efforts at utilizing aerial imagery of Atlantic bluefin tuna (ABFT, *Thunnus thynnus*) from spotter aircraft were not successful at getting measurements to the desired precision. Unmanned aerial systems (UASs) offer alternative platforms that have the potential to augment or possibly replace manned aircraft for scientific observations and measurements. In 2015 and 2016, we conducted pilot projects on ABFT and Atlantic menhaden (*Brevoortia tyrannus*) to evaluate the utility of APH-22 hexacopters for collecting digital imagery used to measure school areas and attributes of individuals (e.g., length, breadth, nearest-neighbor distance) to the precision required in fisheries assessments. To achieve the desired precision, we calibrated the cameras and lenses (20 and 25 mm), assessed the accuracy and precision of the APH-22's motion and altitude sensors, evaluated the accuracy and precision of our fish measurements using targets of known size, and have added a gimbal to the APH-22. In addition, underwater acoustic data from a forward-looking bow-mounted transducer were collected to measure the acoustic properties and estimate the vertical dimension of the schools, which when combined with the aerial measurements, will allow us to estimate abundance and biomass. We present our initial results and “lessons learned” towards the ultimate goal of providing estimates of population abundance for use in fisheries and ecosystem-based management using UAS platforms.

Presentation to NOAA's UAS Conference, 25-27 Oct. 2016